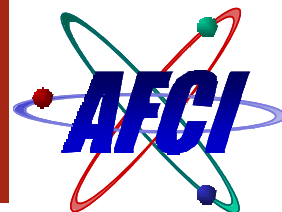


# Advanced Fuel Cycle Initiative



Technical Monthly - January 2003

## Technical Integration

## Systems Analysis

- [SNL] Initiated preparation of AFCI Comparison matrices as per Congressional request
- [SNL] Attended joint Generation IV-AFCI integration meeting in Washington, DC.
- [SNL] Development, integration and transmittal of AFCI FY 2003 Draft Work Packages to DOE-HQ for budget analysis and prioritization.
- [SNL] Participation in AFCI Systems Analysis meeting on Transmutation in Idaho Falls, ID
- [SNL] Prepared and disseminated first AFCI monthly to DOE HQ and NTDs
- [SNL] Began preparations on the 1st FY03 AFCI quarterly report. Issues regarding classification and dissemination have begun with NTDs and HQ. Dissemination expected by end of March.

*For more information on Technical Integration contact Gary Polansky: (505) 845-7029*

### Transmutation Studies and Integrated Fuel Cycle Modeling

- [All] A Transmutation Systems Study Meeting was held at INEEL on February 4-5, 2003, to discuss short- and long-term activities under the following tasks: Transmutation Criteria, Transmutation Options, and Transmutation Analyses. The meeting was used to define and integrate the work scopes and responsibilities of each participating laboratory.
- The repository impact of using once-through MOX fuel has been estimated and compared with repository conditions resulting from using only spent PWR fuel. The comparison was done on the basis of the amount of PWR fuel that needed to be processed for fabricating a MOX assembly, preserving the total energy generated by the fuel. Key results include:
  - [ANL] No change in the size of the repository is needed, regardless of whether PWR or MOX fuel is used, since the total decay heat is virtually the same at 100 years after discharge, and only slightly higher for the MOX case prior to 100 years.
  - [ANL] Use of MOX fuel reduced the amount of plutonium sent to the repository by about 35%, with the reduction in Pu-239 being over 50%.
  - [ANL] Use of MOX fuel increased the source term for the long-term dose dominant Pu-241/Am-241/Np-237 chain by about 10%. (ANL)
- Progress was made on performing the benchmark of the CEA COSI and our NFCSim Codes:
  - [LANL] Reached an agreement with the French on the scenario to be used in the

# Systems Analysis

benchmark.

- [LANL] Modified NFCSim to handle the special requirements of the benchmark scenario.
- [LANL] Prepared a generic AFCI reprocessing flow sheet including capital and operating cost estimates. This helps prepare for a systems assessment of the affect that multiple recycling of MOX has specifically on reprocessing and fuel fabrication costs, and generally on the system wide cost of electricity and proliferation risk. (LANL)
- [LLNL] Participated in a meeting between AFCI and DOE-RW to promote a working interface between the NE-AFCI program and the RW-geologic disposal program. Agreement was reached on initial information exchange, cooperation participants, and the roles and general approach to cooperative studies. Following the meeting, a draft Memorandum of Agreement between NE and RW was prepared, and is in review. (LLNL)
- [ANL] A detailed work plan for systemic inter-comparison of transmutation systems was developed. Both fast and thermal reactors using conventional and dedicated fuels will be considered. The work will summarize existing studies and quantify key physics parameters. A breakdown of the work between CEA and DOE for the ongoing collaboration was proposed.
- [ANL] Detailed isotopic vectors (actinides, fission products) were prepared for spent  $\text{UO}_2$  and MOX (separated Pu) assemblies. Accurate data from WIMS8 fuel cycle analyses were blended with detailed ORIGEN2 isotopic vectors to provide data useful for repository impact analyses.
- [LANL] The ORIGEN2/NFCSim interface has been further refined with the addition of a stand alone criticality engine and burnup-calculation driver for single-pass Tier-1 LWRs based on reactor criticality and power peaking to derive cycle-dependent initial compositions and burnups.
- [LANL] Initiated MCNP-based reactor physics analysis of evolutionary high-temperature gas-cooled reactors for integration into NFCSim.
- [ANL] Work continued on the development and verification of an extended lattice model using the WIMS8 code. This model is being used for Series 1 MOX assembly design analysis.
- [ANL] The LWR lattice code (DRAGON) is being assessed as an alternative to the proprietary WIMS8 code for LWR assembly design and fuel cycle analyses. This assessment involves the comparison of DRAGON results to those from WIMS8 and MCNP.
- [ANL] The final task of Phase 1 has been initiated – involving the evaluation of safeguards options and the development of an integrated facility design including safeguards.
- [LANL] Attended Energy Modeling Forum (EMF) meeting at Stanford and delivered an overview of Nuclear Fuel Cycle (NFC) optimization activities and outlook to working groups.
- [LLNL] Repository impact participant work scopes are being reviewed to integrate results into a combine product.

***For more information on Systems Analysis  
contact Ralph Bennett: (208) 526-7708***

# Separations

## Advanced Aqueous Separations

- [INEEL] UREX+ Engineering-Scale Demonstration. As a result of INEEL-DOE-NTD discussions, it was agreed that the Engineering Scale Demonstration efforts will be redirected to TAN-607 because of concerns that the costs associated with upgrading the FDP may be excessive. The proposed TAN area is currently empty and fairly clean and would not require extensive decontamination. In addition, the fuel to be processed is located in dry storage at the TAN area. If a major problem is identified at TAN, the FDP cell could still be a fallback location. Studies on using the INTEC Remote Analytical Laboratory will not be continued, as only very short duration testing could be conducted—for a single process at a time at engineering scale. The full process demonstration line will first be tested cold to show early progress and demonstrate equipment operation, then relocated to TAN-607 for subsequent hot testing in 2006. All of these efforts will be funded using R&D operating funds and it is planned that CD-0 approval for the demonstration will be obtained at the same time as CD-0 approval for the large Spent Fuel Treatment Facility.
- [ORNL] *SANEX Process Development*. Work with the chlorophenyl- and phenyl-dithiophosphinic acids has continued with extraction testing at higher Am concentrations (1.0 g/L versus 0.02 for tracer experiments). The chlorophenyldithiophosphinic acid extractant showed good Am distribution and good separation from the lanthanides. A precipitate formed within the first hour of equilibration with the phenyldithiophosphinic acid extractant. Synthesis of the BTP extractant 2,6-bis(5,6-di-ethyl-1,2,4-triazin-3-yl-pyridine continued with the preparation of the final two intermediate compounds. One of the compounds is being further purified before the reaction to form the BTP extractant.
- [ORNL] *Modified Direct Denitration Process Development*. The surrogate fission product nitrate solution for use in demonstration of the Modified Direct Denitration process is being prepared with the dissolution of several oxide compounds. The remaining compounds will be added as nitrate salts to yield a surrogate for testing compound separation by precipitation, modified direct denitration, and dissolution of selected compounds by water and basic rinses. The rotary furnace and the associated off-gas scrubbing system are currently being installed in the glove box with service lines and electrical pass-through connections being completed. Operation of the rotary furnace can continue during this installation and work with the surrogate solution.
- [ANL] *AMUSE Code Development*. AMUSE version 2.2 was released on February 28, 2003. The major changes in AMUSE 2.2 are improved D-value algorithms for Pu-TBP and TcO<sub>4</sub>-TBP extraction, and the addition of ClO<sub>4</sub> species. New options were added to (1) calculate D-values for a user-specified aqueous phase where the organic phase is assumed pre-equilibrated, and (2) add the ability to create flowsheet data files for multiple runs. Version 2.2 also added the ability to store the initial aqueous stream density, final aqueous density and the process temperature in each stage. [ANL]
- [ANL] *Advanced Spent Fuel Dissolver*. Design and fabrication of a high-temperature dissolver for spent-fuel dissolution has been completed. The dissolver is a 2-liter stainless steel (304L) pressure vessel designed for remote operation in a shielded cell. It was placed in the ANL-205 shielded cell mock-up facility to develop procedures and to reveal any weaknesses in the design. Testing of the fuel dissolution procedure will begin in March.
- [ANL] *Centrifugal Contactor Design*. Studies

## Separations continued

on the modification of the 2-cm contactor interstage lines to be used in the UREX+ laboratory-scale demonstration have been completed. An internal report was prepared detailing these studies and the rationale behind the selection of the optimum design of interstage lines.

- **[ANL]** Development of CDC/PEG Extraction Process for Recovery of Cs and Sr. A data base for distribution coefficients for Cs and Sr in the CDC/PEG process is being established. The data base will be used to develop extraction modules for AMUSE. The data have been provided by INEEL and also obtained from literature publications.
- **[WSRC]** UREX Hot Demonstration. SRTC continues to pursue alternatives for fabricating U samples as souvenirs from the UREX demonstration. Additional information has been requested from a vendor on standard shapes available for the mounting of souvenirs.
- **[INEEL]** Engineering-Scale Demonstration. High-Level Function and Requirements (F&R's) have been revised according to current direction, approved, and issued for the Engineering Scale Demonstration. The F&R's were completed on schedule to meet a performance measurement plan with DOE-ID.
- **[INEEL]** Engineering-Scale Demonstration Facility Feasibility Study. A subcontract was awarded to Washington Group International (WGI) to complete an Engineering Scale Demonstration feasibility study. A kickoff meeting was conducted at the INEEL on February 11-12. The first day the WGI personnel were taken on a tour of TAN-607 and FDP/FSA areas at INTEC. They were directed at the kickoff meeting to concentrate their efforts on the use of TAN-607 for the demonstration. The A-E SOW was quickly revised to look at the TAN facility. A formal design change and an analysis of the cost/schedule impacts to the contract with WGI is underway. Since these changes have occurred at an early stage in the design efforts, it is expected that the impacts will be minor.
- **[INEEL]** Pre-Conceptual Design Study. A draft Statement of Work (SOW) for WGI was completed and includes studies for the A-E to look at both aqueous processing and pyrochemical processing alternatives. The current contract with WGI allows for the large Spent Fuel Treatment Facility (SFTF) preconceptual design to be added as a second phase of work. The SOW along with the draft F&R's has been transmitted to the A-E for cost and schedule estimates. The INEEL is also completing estimates for this work which is expected to be conducted from March 2003 through December 2003.. The A-E work is dependent on receiving the \$1.7 million in AFCI (NE) funding.
- **[INEEL]** Cesium/Strontium Extraction. Laboratory testing has been initiated for development of a chlorinated cobalt dicarbollide (CDC)/polyethylene glycol (PEG) based solvent extraction process for the separation of Cs and Sr from dissolved LWR fuel. Batch contacts were performed using a simulated UREX raffinate solution with a composition of 0.5 M  $\text{HNO}_3$ , 3E-03 M stable Cs, 2E-03 M stable Sr, and trace amounts of Ba, Pb, Mo, and Zr. Stable Cs and Sr were added to the simulant in an amount equivalent to the total mass expected in the UREX raffinate. This will allow any solvent loading effects to be evaluated with this testing. This simulant was spiked with  $^{85}\text{Sr}$  and  $^{137}\text{Cs}$  and contacted with a solvent consisting of 0.072 M CDC and 0.017 M PEG in a phenyltrifluoromethyl sulfone diluent. Distribution coefficients of 620 and 35 were obtained for  $^{85}\text{Sr}$  and  $^{137}\text{Cs}$ , respectively. A second contact using the solvent from the first contact (now equilibrated with the stable Cs and Sr) and fresh simulant feed yielded distribution coefficients of

## Separations continued

88 for  $^{85}\text{Sr}$  and 24 for  $^{137}\text{Cs}$ . These high distribution coefficients indicate that a CDC/PEG process should be very effective in separating Cs and Sr from dissolved LWR fuel. Further testing is underway to optimize the solvent composition as well as test the effectiveness of several potential stripping reagents.

### Pyrochemical Separations

- [ANL] *Transuranic Recovery System*. The design package for the advanced laboratory-scale U/TRU recovery system was reviewed for safety, functionality and manufacturability. The package was approved and released to the shop for fabrication. Further tests of the chlorine scrubber for this system provided additional data that will be used to identify the optimum operating conditions for scrubbing the chlorine off-gas.
- [ANL] *High-Throughput Electrorefiner*. Design of the planar electrode electrorefiner test module is progressing ahead of schedule. The concept is about 90% developed and detailing of the design will begin soon.

### Engineered Product Storage

- [ANL] *Plutonium Storage*. At the February 19 Engineered Product Storage meeting at ANL, commercial plutonium storage practice were discussed. Information regarding the British and French commercial plutonium finishing and storage systems, and the LaHague HLW glass storage were provided by ORNL to assist in this task.
- [ANL] *Recovery of Technetium and Its Conversion to Metal*. A draft report summarizing Tc processing options that have been reported in the open literature has been prepared. Based on this draft, a number of process combinations are currently being evaluated for suitability to the treatment of UREX Tc strip product for conversion to metal. These evaluations will be incorpo-

rated into the final report that will form the basis for further testing and development at the lab-scale. [ANL]

- [LANL] *Technetium Reduction*. At the Engineered Product Storage Team meeting held at ANL on February 19, discussion of future actions included the need for development of a technetium strip simulant based on the technetium product stream from run 2 (3-6 hrs) and run 3 (4-8 hrs) of the WSRC/SRTC UREX hot demonstration experiment. The inclusion of AHA, TBP, and DBP in the simulant was done to anticipate their potential interference in the subsequent technetium reduction chemistry. The current scheme for processing this simulant is to distill the acid (which helps destroy the residual AHA), wash the residue with a solvent to remove TBP, and DBP, and then dissolve the residue with water. Dissolution by water may achieve some decontamination from actinides as they are generally less soluble at neutral pHs. At this point reduction to Tc metal or  $\text{TcO}_2$  with  $\text{BH}_4^-$  or  $\text{N}_2\text{H}_4$ , respectively, will be attempted to determine recovery and purity. If further decontamination is needed various options such as cation exchange (for Cs and Sr) and water-soluble chelating polymers (for actinides) will be tried.
- [LANL] *Transmutation or Storage of Technetium*. Metal at this point seems to be a good choice for either storage or transmutation because both beta decay and transmutation produce a Tc/Ru solid solution in all proportions. Other favorable properties of the metal are its high melting point,  $2140^\circ\text{C}$ , and the fact that massive technetium metal tarnishes slowly in moisture. The process of setting up a box to do technetium metal plating experiments from room-temperature ionic liquids has been started, with a goal of producing a thin film of Tc metal for a transmutation experiment this summer.



## Separations continued

### Spent Fuel Treatment Facility Design

- **[ORNL]** *Analysis of Spent Fuel Inventory.* Additional analyses of the changes in the characteristics of spent fuel as a function of age were performed to provide information to support selection of a baseline feed to the processing plant. These analyses included relative heat generation rate, relative total activity, relative masses of selected fission products, and relative quantities of americium and curium. Results will be presented at the next Separations Working Group meeting.
- **[ORNL/WSRC]** *Deployment Strategy.* The Deployment Options Activity Team has begun initial efforts towards development of a strategic plan for separations deployment. Primary considerations are the (1) spent fuel feed strategy (age of fuel, plant throughput, feed logistics, etc.), (2) product strategy (types and forms, storage requirements, etc), (3) byproduct and waste strategy, and (4) process verification strategies. A team meeting was held at Argonne National Laboratory to discuss the separations deployment issues and identify those issues that need resolution. A list of key deliverables and assignments was developed. These deliverable will take the form of a series of white papers that document the basis of assumptions and selected requirements. Feedback from Separations Deployment Activity team members on the deployment plan has been consolidated. A table of assumptions and an updated matrix (originated at the February team meeting) has been sent out for review and comment. The team “met” again via conference call on March 11 to discuss comments and to status action items. An effort is underway to generate a quality draft of the deployment plan by the end of May.
- **[ORNL/INEEL]** *Pre-Conceptual Design of Large Spent Fuel Treatment Facility.* Work continued on the preparation of a document describing the high level functions and require-

ments (F&Rs) for a green-field spent fuel processing plant. The high level functions and requirements are written in a technology-neutral form because the current schedule does not call for a down-select to a base technology until ca. 2007. The primary base technologies under consideration are pyrometallurgical and aqueous (UREX+) processes. A Pre-conceptual Design Activity Team meeting was held in Idaho Falls to discuss the draft document, reach consensus on the contents, and drive toward a final version.

- **[ORNL]** *Technology-Specific Facility Design.* Efforts to prepare a separate functions and requirements document for an aqueous based processing plant continued. As a technology-specific document, greater detail on the functions of individual subsystems is being developed, but references to specific process equipment and design attributes (e.g. number of stages, etc.) are being avoided. This information will also be useful as input to the design for the aqueous-based Engineering Scale Demonstration.

### Advanced process Development

- **[LANL]** *Actinide crystallization process.* A mass and energy balance has been calculated for a 500 metric ton/year two-stage uranyl nitrate crystallizer that includes all recycles. The volume reduction and uranium removal results are very encouraging. The initial continuous crystallization unit will be a circulated-loop crystallizer. A 3" diameter loop made of glass pipe previously operated on another process will be adapted for the crystallization development work. A piping and instrumentation diagram has been designed and drawn for this application. The equipment list and instrument list have been prepared and orders placed for items.
- **[LANL]** *High-temperature fractional crystallization.* Synthesis and float-zone processing of a  $\text{ZrO}_2$ -doped  $\text{TiO}_2$  fuel surrogate continues. The next experimental step has been outlined and

## Separations continued

includes synthesis of a  $\text{ZrO}_2$ -based surrogate that is doped with Sr, Cs, and Nd. Once this material is produced, characterization to assess the distribution of these trace elements will begin. Calorimetric data will be collected so that a more detailed model of this system can be developed.

### **EBR-II Spent Fuel Treatment**

- [ANL] *Transuranic Recovery*. The first series of laboratory-scale tests assessing TRU recovery methods with irradiated materials started this month in the Hot Fuel Examination Facility (HFEF). The results of these tests will be used to support the engineering-scale tests planned for FY04. These tests used salt from the processing of EBR-II driver fuel. The salt was spiked with plutonium feed-stocks.
- [ANL] *Transuranic Recovery from Irradiated Fuel*. A Categorical Exclusion for engineering-scale tests of TRU recovery to be performed in the Fuel Conditioning Facility (FCF) in FY04 was obtained from DOE. No further NEPA review is required for these tests. The TRUs recovered during this phase of testing will be recycled back to the electrorefiners after characterization. If the materials are used in fuels testing, an additional NEPA review will be required.
- [ANL] *EBR-II Spent Fuel Treatment*. Forty-eight kilograms of EBR-II blanket fuel were treated in the Mark V electrorefiner in February. A total of 144 kilograms of fuel has been treated to date in FY03.
- [ANL] *Hot Demonstration of Oxide Reduction*. Fabrication of equipment to operate the Hot Fuel Dissolution Apparatus in HFEF for electrolytic reduction of oxide fuel at laboratory scale is complete. Preparation of procedures to install and operate the equipment is underway. Preparation of oxide fuel (i.e. decladding, crushing, and sieving) to demonstrate the electrolytic reduction pro-

cess is in progress.

- [ANL] *Cathode Processor Enhancement*. Qualification testing of equipment to increase the capacity of the FCF Cathode Processor was completed. Implementation of these upgrades will be deferred until FY04 due to limited funding.

*For more information on Separations contact  
Jim Laidler (630) 252-4383*

## Integration

- [NTD] The meeting minutes for the first FDWG meeting was published and the second FDWG meeting was held in Salt Lake City on February 16-17, 2003. Representatives from DOE-NE, LANL, ANL, INEEL, ORNL, SNL, GA and WSRC attended the meeting.
- [NTD] With input from ANL, INEEL, and LANL, an initial multi-year cost estimate (FY03 through FY10) was prepared and submitted to DOE.
- [NTD, SNL] Based on the budget baseline included in the program plan, all work-packages (with initial input by the WP managers) and an integrated fuel development schedule was completed. Those are currently being revised based on the actual FY03 budget appropriation passed on Feb 15<sup>th</sup>.
- [NTD] The fuel development NTD was prepared to attend the JAERI/JNC JCC meetings (Feb. 17-20) in Japan. In the last minute, he cancelled the trip to be able to assist in the more pressing need for budget and scope prioritization based on the FY03 budget appropriation and to attend the integration meeting among the NTDs held in Washington D.C with Bill Magwood and Shane Johnson. Nonetheless, the presentation focusing on LANL research activities for the AFCI program was forwarded to the Japanese hosts and presented at the meeting by Phillip Finck (ANL).
- [NTD] With input from LANL, ANL, ORNL, and INEEL, the FY03 first quarter's technical progress report for fuel development was compiled and submitted to SNL.
- [INEEL] Finis Southworth, who is the product manager for the Very High Temperature Reactor (VHTR) concept in GEN IV, attended the 2<sup>nd</sup> FDWG meeting and gave an overview of the VHTR deployment plan, with emphasis on fuel development needs

## Series One Fuels Design, Specifications and Analyses

- [WSRC] WSRC representative participated in the Separations Deployment Activity Team meeting to promote integration and consistency between the Separations and Fuels Deployment Plans.
- [WSRC] Steve Sheetz participated in the 2<sup>nd</sup> FDWG meeting and presented the status of Series One Implementation plan development and the findings of his visit to Vogtle Power plant in reference to refueling operations.
- [ORNL] Brian Cowell participated in the 2<sup>nd</sup> FDWG meeting and discussed the testing needs and requirements for the Series One LWR fuel. Brian also discussed the analyses needs and status for Series One fuels.
- [ORNL] Because of delays in receiving ORNL's FY03 funding distributions and due to uncertainties regarding the final budget and work-package guidance, the SERIES ONE - LWR Fuel Specifications and Analyses Task has yet to start in earnest. Limited progress is being made within the funding constraints, and it is still believed that the schedule can be made up as soon as the budget and work-package uncertainties are resolved.
- [ORNL] Interactions with the Institute of Transuranium Elements continued during February, and ITU finally obtained permission from EURATOM to release the code to ORNL for the stated applications. The terms of the transfer, including data exchange for some existing ORNL data of interest to ITU, should be finalized during March.
- [ORNL] Iterations with the other members of the Series One Deployment Subgroup continued during February. As part of that effort and as part of the preparation for the planned analyses, a schedule was drafted for the experimental work up through and including the lead-test assembly



## ***Fuels continued***

programs. Additional work is required to refine the schedule and develop the associated cost profile.

### **Series One Fuel Development & Fabrication**

- [LANL] Approval for minor facility modifications associated with the furnace to process LWR fuel has been granted, and the work is scheduled for March.
- [LANL] The investigation of the oxygen diffusion in  $\text{CeO}(2-x)$  continued in February. Some preliminary results were compiled into a paper titled "A Model of Defect Thermochemistry in Non-Stoichiometric Ceria," by M. Stan and P. Cristea. The paper was submitted and accepted for presentation in Malbaie 2003 Calphad Conference XXXII. International Conference on Phase Diagram Calculations and Computational Thermochemistry", May 25-30, 2003, La Malbaie, Quebec, Canada.

### **Series One ATR Irradiation Experiments**

- [INEEL] The needed activities to get ready for LWR-2 (loop) irradiation preparations is presented and discussed in the 2<sup>nd</sup> FDWG meeting.
- [INEEL] Due to lack of funding, no work has been initiated on LWR-1 Series One irradiations.

### **Series Two Fuel Design Specification and Analyses**

- [ANL] A complete set of transport theory reactivity coefficients were compared for the conversion ratio (CR) = 0.5 and CR=0 designs. Transport effects are most pronounced in the GEM worth and the sodium void worth. A discrepancy between the VARIANT results and higher order methods is observed for the sodium void worth of the high leakage CR=0 system.
- [ANL] Reports from CEA regarding the fast burner reactor CAPRA project were reviewed. Several unique features were noted (e.g., implementation

of subcycles to reduce reactivity losses), but no novel design options to substantively improved burner performance were identified.

- [ANL] Low conversion ratio design options using compact fast reactor core geometry, as compared to the high leakage configurations employed in FY02, were explored; such designs would have economic benefits associated with reduced core radius. By reducing the fuel volume fraction, burner core designs with conversion ratio ranging from 0.5 to 0.0 were developed.
- [ANL] Reactivity coefficients for the compact designs were compared to FY02 results. As expected, the sodium void worth and radial expansion coefficient are adversely impacted because of the reduced core leakage. Scoping safety studies will be pursued to assess the impact on passive responses to key transient scenarios.
- [ANL] Doug Crawford participated in the 2<sup>nd</sup> FDWG meeting and discussed the functions, requirements and selection criteria for Series Two transmutation fuels.

### **Series Two Nitride Fuel Development**

- [LANL] Two new pieces of equipment for processing actinide ceramics, a ball mill and a sieve shaker, were installed into PF-4 and approval for their operation was obtained. This equipment should greatly improve the efficiency and quality of the processes.
- [LANL] Reproduced and confirmed earlier reports on 450 keV  $^{216}\text{Xe}/\text{cm}^2$  implant into ZrN. The sample has shown to not amorphize and that the damaged layer is epitaxial to the unirradiated layer below.
- [LANL] In continuing the effort to minimize Am volatilization during fuel processing, the nitride pressing parameters continue to be optimized and the sintering aid study has been restarted.

## ***Fuels continued***

- [ASU, LANL] Hardness measurements on radial and longitudinal planes in sintered ZrN pellets have shown significant increases on hardness after heat treatment. The increase was found to be a strong function of orientation.
- [IC, LANL] The range of materials for which Xe solution has been considered (using energy minimisation) have been extended to include NpN, PuN and DyN.
- [IC, LANL] The bulk and shear modulus for CmN, PuN, ZrN and TiN have been predicted using the quantum mechanical (QM) code CASTEP. Long term QM calculations of U solution in ZrN and nonstoichiometry in TiN and ZrN continue.
- [LANL] Thermochemical calculation in the Pu-N system confirmed the assessment of the phase diagram that we have recently reported. A journal article on the Pu-N work is being prepared for the Journal of Nuclear Materials. The first principles calculations for the Am-N system have been completed and current work is on the Modified Embedded Atom potential. This data is necessary for Am-N phase diagram assessment.
- [LANL] Bob Margevicius and Ken McClellan participated in the 2<sup>nd</sup> FDWG meeting and discussed the status of nitride fuel development with emphasis on Americium volatility and low sintered densities.

### **Series Two Metallic Fuel Development**

- [ANL] Test castings were performed on a low-fertile metallic fuel composition (U-29Pu-4Am-2Np-30Zr, wt%) for AFC-1 F using depleted uranium. Specimens suitable for thermal analysis, microstructural characterization, and irradiation were produced.
- [ANL] Two FCCI diffusion couple samples were prepared for examination and examined by SEM/EDS. Analysis results are forthcoming.

- [ANL] A presentation on the status of metallic fuel development and characterization was given by Mitch Meyer at the 2<sup>nd</sup> FDWG meeting in Salt Lake City. Details on fabrication, microstructural characterization, and thermal analysis of AFC-1B and -1D metal alloys were presented.

### **Series Two TRISO Fuel Development**

- [ORNL, GA] Dave Williams and Don McEachern attended the 2<sup>nd</sup> FDWG meeting and provided an the status of TRISO fuel development and an overview of future development needs.
- [ORNL] Specifications and drawings for a glove box to contain the Pu/Np internal gelation equipment are being reviewed to aid in the preparation of a bid package.
- [ORNL] Equipment for a revised Pu/Np internal gelation process is being specified.
- [ORNL] Stereomicroscope for support of materialography and low magnification inspection has been installed.
- [ORNL] Specimen mounting procedures for materialographic preparation are under development.
- [ORNL] Optical equipment for computer controlled quantitative analysis station has been ordered and initial software development is underway.
- [ORNL] Final procurement documentation for equipment to support coated particle fuel density measurements has been prepared. Reconfiguration of laboratory space for uranium work is proceeding on schedule and under budget. Both of these activities are supported by the AGR program and are critically important to the progress of AFCI activities.
- [ISSUE: ORNL] Delays in procurement of

## ***Fuels continued***

characterization equipment to be provided by the AGR program may delay coating development work.

### **Series Two Advanced Fuel Forms**

- [LANL] Initial melt processing has begun for a “fissium”-based (50Ru/ 30Mo/ 10Re/ 10Rh) fuel matrix.

### **Series Two ATR Irradiation**

- [ANL, LANL] Initial metal and nitride compositions for the low-fertile AFC-1E nitrides were determined and forwarded to INEEL for the first round of calculations on their feasibility.
  - [LANL] Data packages including the QA documents for the nitride pellets of ATW1A were delivered to ANL for review.
  - [INEEL] We are currently pursuing dual-paths for experiment thermal neutron shielding to ensure May reactor insertion of the AFC-1 A-D experiments.
  - [INEEL] A prototype basket using a cadmium shield encased in aluminum shroud was successfully fabricated. Ten ATRC baskets will be fabricated and are scheduled for deliver in late March.
  - [INEEL] Work continues on drilling the borated aluminum rods. The drilled rod is scheduled for delivery in late March.
  - [INEEL] A sample piece of borated aluminum rod will be used to qualify welders to weld borated aluminum-aluminum joints. The qualification is expected to be obtained prior to receipt of the rods in late March.
  - [INEEL] The thermal and physics analyses performed on the borated aluminum and cadmium shrouding are approximately 90% complete. All results are favorable.
  - [INEEL] Basket drawings for the ATRC borated aluminum and cadmium baskets have been completed and are currently in the approval stage.
  - [INEEL] It was concluded that the AFC-1 (E & F) irradiations would meet the required burnup prior to CIC if the insertion schedule is met, and therefore no delay of the CIC is required.
  - [INEEL] The status of the AFC-1 (a-d) irradiation preparations is presented and discussed in the 2<sup>nd</sup> FDWG meeting by Richard Ambrosek.
  - [INEEL] The Advanced Test Reactor Critical facility mockup test is planned for early April. Measurements will support the Core Safety Assurance Package and the Experiment Safety Assurance Package.
  - [INEEL] Due to lack of funding, no work has been initiated on AFC-1(E & F) Series Two irradiations.
  - [ANL] Final preparations were made for nitride fuel encapsulation, including review of LANL nitride pellet inspection data supplied to ANL-W on February 27, 2003 and staging of nitride fuel transfers and components.
  - [ANL] The AFC-1A, -1B, -1C & -1D Experiment Description and Design & Data Package, including drawings, was revised to reflect the removal of the Pu-Np-Zr alloy from the fuel test matrix and to make the rodlet thermal analysis consistent with rodlet powers calculated assuming a Cd neutron filter is used to shroud the experiments instead of the borated-aluminum filter.
  - [ANL] At the request of INEEL, the ANL-W machine shop developed tooling and fabrication techniques to fabricate a Cd neutron filter basket. Difficult machining and welding problems were overcome, and the fabrication of a prototype Cd ATRC basket was completed.
-

## Fuels continued

- [ANL] The main portions of the Experiment Design for the AFC-1E and AFC-1F low-fertile fuel experiments in ATR was completed. Final details will be completed in March, when final isotopic/enrichment needs to meet target experiment linear heat generation rates are generated by INEEL.
- [ANL] Substantial progress was made on the ANL-W review of the LANL AFC-1 QA Program. The status of unresolved issues was reported by a memorandum to the responsible parties. We expect that these issues will be resolved.
- [ANL] A transportation plan for the irradiated AFC-1A, -1B, -1C, and -1D experiments was presented by S. Hayes (ANL-W) at the FDWG Meeting in Salt Lake City. According to the plan, the experiments will be shipped directly from the ATR Canal to ANL-W for PIE using the GE-2000 cask. The plan was accepted in principle, but the availability of funds is still under discussion.
- [ISSUE: ANL, INEEL] The ANL-W machine shop will fabricate cadmium flux trap baskets under contract to INEEL. The contract for fabrication of the prototype Cd basket was completed. Two types of baskets are required; one type for an ATR-C (critical facility) run and one type for the AFC-1 experiment irradiation in ATR. In order for the ten (10) ATR-C baskets to be supplied in time for the ATR-C run to support a May ATR insertion (cycle 131A), the contract for fabrication must be finalized prior to March 10, 2003.

### Series Two FUTURIX Irradiation

- [ANL, LANL] The US contribution to the Presentation Report, which will formally proposed the FUTURIX irradiation experiment in Phénix to the reactor authorities, was submitted to the CEA. The proposed US fuel compositions are: U-29Pu-4Am-2Np-30Zr and Pu-12Am-40Zr metallic fuels, and (U<sub>0.50</sub>,Pu<sub>0.25</sub>,Am<sub>0.15</sub>,Np<sub>0.10</sub>)N and

(Pu<sub>0.50</sub>,Am<sub>0.50</sub>)N-30ZrN nitride fuels.

- [ANL] We have been working with the CEA to resolve questions related to the Japanese METAPHIX experiment in Phénix. Resolution of these issues will aid in development of the basis for irradiation of the FUTURIX test.
- [ANL] Documents supplied in French pertaining to research and development plans for irradiation experiments in Phénix were reviewed. A draft plan for metallic fuel was developed for submission to the AFCI Fuels NTD based on the CEA prototype document.

### ATR Fast Flux Booster Design

- [INEEL] Due to lack of funding, no work has been initiated on the fast flux booster design.

### Looking Ahead

- Fuel development NTD will attend the OECD/NEA Working Party on Partitioning and Transmutation meeting on March 12-14, 2003 in Paris, France. During the same meeting, he will also chair the subgroup meeting on Accelerator Utilization and Reliability.
- Fuel development NTD will also take the opportunity to remain in Paris until the MEGAPIE technical review meeting on March 18-19, 2003 and to present the AFCI project concerns on the MEGAPIE target design issues.
- The date for the CEA QA workshop for FUTURIX experiments is set to April 28-29, 2003. Mitch Meyer (ANL), Steve Hayes (ANL), Ken Chidester (LANL) and Bob Margevicius (LANL) need to travel to Cadarache, FRANCE for this workshop and the travel request forms are submitted to DOE-NE.

*For more information on Fuels contact Kemal Pasamehmetoglu: (505)667-8893*

# Transmutation

## INTEGRATION [LANL]

- The national technical director for transmutation engineering attended a one-day coordination meeting with the Generation-IV program national directors and DOE program management. The result of the meeting was an agreement on the path forward for developing a top-level integration plan for AFCI, Generation-IV and NP2010. Also, a general consensus was reached on the process for developing a University Program within Generation-IV. We provided input on successful University Programs that were established for the APT and AAA projects.

## PHYSICS

### Cross-Sections

- [ANL] The re-analysis of the PROFIL-1 experiment with the new R-Z model approach was completed, showing results consistent with that obtained during a previous analysis. Analysis of the PROFIL-2 experiment continued, showing relatively good agreement to corresponding C/E (calculated/experimental) values obtained from PROFIL-1.
- [LANL] Analysis of Hydrogen-Helium (H/He) production data taken in the recently completed cycle is underway, and new software is being written to speed the process.
- [LANL] Final calibration of the charged particle detectors at LANSCE with an alpha-particle source was completed, and maintenance of the H/He-production experimental apparatus is in progress.
- [LANL] Nuclear level density information for nickel isotopes is being compiled for input to reaction model calculations.

### Codes (Fuel Cycle Method Code Development)

- [ANL] The RABANL option with subroutine merger in the MC2-2 code was updated to allow for an increased ultra-fine group structure.

- [ANL] An alternate approach to the first-order integral method is being investigated for vacuum node treatment to try to overcome some specific difficulties, even though the integral approach is more desirable because of a lower computational burden.

## MALIBU

- [ORNL] CEA and COGEMA have both officially joined the MALIBU program. With these new members, Belgonucleaire has announced that they can open the program. The technical program meeting is now scheduled for May 2003.

## STRUCTURAL MATERIALS

### Materials Testing

- [LANL] Discussions were held at the Idaho Accelerator Center to discuss use of positrons for analyzing irradiation-induced vacancy, interstitial and helium clusters in materials.
- [LANL] Bill Corwin (DOE-NE, Gen-IV) visited LANL and met with researchers to discuss collaborative efforts with respect to materials testing and lead research for applicability to the Gen-IV program.

### Hot-Cell Activities

- [LANL] Bend tests were performed on SS-316L and Mod 9Cr-1Mo control specimens at room temperature, 250°C and 500°C.
- [PNNL] PNNL provided information on availability of ferritic-martensitic materials irradiated to up to 100 dpa in FFTF that may be of interest to the AFCI effort.

### Materials Handbook

- [LANL] The first draft of the new chapter on Tantalum received a thorough first review by the Handbook Coordinator, with figures currently being added for more general review.
- [LANL] Information and data for HT-9 steel are



## ***Transmutation continued***

being extracted from open literature publications for incorporation into a new chapter. Data compilations completed this month include tensile properties, ductile-to-brittle transition temperature, and fracture toughness on both irradiated and non-irradiated materials.

- [LANL] A draft paper describing irradiation of a clad-tungsten neutron source was completed.

### **Radiation Damage Modeling**

- [LANL] First-principles calculations for determining Fe-He cross-interactions were completed.

### **COOLANT TECHNOLOGY**

#### **DELTA loop**

- [LANL] Work continued on determining the best sealing method for the oxygen sensors. Gaskets were made of various materials, including Graph-lock and tantalum. Loads necessary to seal gaskets were determined using the ASME Boiler and Pressure Vessel Code, engineering references and manufacturer's recommendations. Tests to determine the leak rate of both tantalum and Graph-lock were performed, results from which indicate a better seal with Graph-lock. Other materials and forms are still being investigated; a more advanced and more complete redesign of the sensor is underway.

### **LBE Technology and Corrosion**

- [LANL] The DELTA Loop TRAC model was updated to track trace species of oxygen and iron solutes, and code bugs are being corrected. Also, assistance was provided to help debug the MEGAPIE TRAC input file.
- [LANL] An LDRD proposal for the investigation of natural-circulation heat transfer and corrosion in lead-alloy liquid-metal-cooled reactor systems was prepared and submitted for funding consideration.

- [LANL] In a joint LANL-UNLV project studying the effects of flow on corrosion under conditions of sudden expansions/contractions in piping, numerical simulation results were found to be in line with theoretical analysis. Comparison with experimental data is underway.
- [LANL] Redesign efforts continued for oxygen-sensor calibration apparatus to accommodate two sensors and thus be more suitable for high temperature materials screening.
- [LANL] The FZK Oxygen Sensor System was completed and is being tested at FZK. It will be delivered to LANL in March. Two FZK staff will visit LANL in May to install and operate the system, and train LANL personnel.

### **ACCELERATOR-DRIVEN SYSTEMS**

#### **MUSE**

- [ANL] In cooperation with FZK (Karlsruhe), corrections have been implemented in the KIN3D module of ERANOS2.0 at Argonne. The code has been tested on the kinetics calculations requested for the MUSE4 benchmark.
- [ANL] For validation purposes, the methodology for taking spectrum transient reflector effects (used for the MUSE4 analysis) was applied to the analysis of the Purdue University Fast Breeder Blanket Research Program, generally showing no energy group effect.

#### **MEGAPIE**

- [LANL] The second detailed design review of the MEGAPIE target was held, but because of insufficient documentation, a third review has been scheduled.
- [LANL] Construction of Integral Test Stand structure was completed.
- [LANL] The LISOR (Liquid-metal Solid-metal Reaction experiments) test has thus far completed 264 hrs of a planned 900-hr test.

# Transmutation continued

- [LANL] DOE contributions to the MEGAPIE Project in February included the completion of the oil/LBE interaction experiments and the initiation of a reliability study, starting with high-risk components.

## TRADE

- [LANL] We provided comments on a matrix comparing target choices for tungsten, SS-316L clad tungsten, tantalum-clad tungsten, and pure tantalum.
- [ANL] The Phase IA Experimental plan for TRADE was revised to reflect the delays in equipment orders and to add reactivity effects of bubble formation in TRIGAs to the measurement program, and will be presented at the Paris TRADE meeting in March by ENEA colleagues.
- [ANL] The TRIGA reactor core to be used for the TRADE experimental program has been analyzed using the DIF3D and MCNP codes in hexagonal geometry. Two different control rod configurations have been considered and compared with the previous MCNP calculation using the real TRIGA reactor geometry.

## UNIVERSITY PROGRAMS

### University of Michigan

- Plans were completed for a second irradiation of T-91 and HT-9, and material has been sent out for sample fabrication.
- The source program for the WIMS-ANL code was acquired to perform LWR transmutation studies, including the denatured thorium cycle.
- A study was initiated to formulate, for source-driven subcritical systems, a functional definition of reactivity so that the deviation from criticality may be determined in various operating states.

### University of California Berkeley

- UC Berkeley identified the optimal lattice for the

molten salt transmuting reactor studies, began finite core analysis, and produced two important results: 1) the total neutron leakage probability is small, consistent with previous assumptions, and 2) use of a graphite reflector flattens the radial power density distribution across the core.

- We completed benchmarking the SCALE code system against an NEA/OECD benchmark for Pu recycling in PWRs, resulting in good agreement and thus increased confidence in SCALE for transmutation studies.
- UC Berkeley has proposed a methodology for quantifying the impact on the repository capacity to compare different transmutation strategies.

### North Carolina State University (NCSU)

- The transmutation yield of Si in the Al-alloy entrance windows of SING targets was calculated. Results indicate a production rate of about 0.01 at % Si per beam-on year, which is insignificant compared to the initial Si content.

### University of Texas-Austin

- Visual coding continued for the proliferation-resistance assessment methodology using Visual Basic and the MS Visio software package to create a user-friendly application for evaluating fuel cycles.
- Preliminary calculations using a full-core ADS deck in MCNPX (linked with ORIGEN) were completed. Results were generated for fuel transmutation rates, fuel and structural material isotopic compositions, decay heat, and radiation-damage rates to structural materials. The results will be used to analyze cross-section values for LANL.

### University of Illinois

- We analytically modeled the impedance spectroscopy (IS) electrical circuit to estimate experimental response for measuring oxide coating growth *in situ* in LBE systems for the

purpose of optimizing IS equipment.

- We reviewed current impedance measurement equipment to determine how best to reach very high frequencies (>1 Mhz) necessary to measure surface films.
- We assembled a computer system for controlling LBE experiments, and selected a metering system for gas delivery to control oxygen levels in the LBE cover and mixing gases.

### **University of Florida**

- The ion-beam facility of the University of Michigan was selected for irradiation of oxide layers on materials in LBE systems. The facility will provide a 3.2-MeV proton beam to a dose of one dpa. Florida and Michigan will share the costs, but only HT-9 samples will be irradiated because of costs.

### **LANL University Projects Leader**

- The University Consortium for Transmutation Research was presented and potential research discussed at Wright-State University and the Air Force Institute of Technology.
- The period of performance for NCSU and the University of Illinois was extended.
- The LANL University Projects Leader, serving as Chair of the Technical Program Committee of the ANS AccApp'03 to be held June 1-5 in San Diego, completed the preliminary program with 175 papers (127 oral, 48 poster) and a diverse and distinguished Plenary session followed by several special sessions. One of the oral sessions will be a memorial session on nuclear data in honor of Dr. Kazuo Shin of Kyoto University, whom we lost in an accident in 2001.

***For more information on Transmutation contact:  
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### **UNLV Transmutation Research Program (TRP)**

#### **Administration**

- UNLV became an approved Partner Organization with the International Science and Technology Center (ISTC). UNLV intends to prolong the LANL contract with IPPE to develop and conduct research on the ISTC Target Complex (TC)-1 located at UNLV.
- The architectural and engineering plans for remodeling Room TBE B-129 for housing the ISTC TC-1 are going through final revision, construction should begin soon, no schedule yet provided by UNLV Construction and Planning Office.
- The contract for remodeling Room HRC-145 for housing the Transmission Electron Microscope (TEM) was released for open bid.
- Six renewal proposals and one new proposal for student research starting summer 2003 was submitted to the TRP Director. Funding will be based on available budget.

#### **Issues**

- Due to University and State regulations regarding construction projects, the construction/remodeling of both the TEM and interim LBE Loop Facilities at UNLV are significantly behind schedule. Both contracts are now released for open bid. The bidding process is expected to take approximately 3 months.

### **UNLV TRP Student Research**

#### **UNLV TRP Fuels**

- The computational meshes for the metallic fuel pins model were refined to get the better numerical results (Task 1).
- A few different mold materials associated with the different initial and boundary conditions such as filling velocities and mold and melt temperatures have been used for the solidification process (Task 1).

# University of Nevada LV

## UNLV TRP Separations

- Development of the Visual Basic (VB) Interface for AMUSE code was completed (Task 8).
- Trade-off techniques for optimizing the system model were examined. Development of the design matrix was initiated (Task 8).
- Completion of plutonium mixture criticality and heat transfer analysis (Task 11).
- Began work on americium mixture criticality and heat transfer analysis (Task 11).
- The Iodine vapor generator assembly was completed (Task 15).
- Several test of iodine sequestration/adsorption were conducted with a commercial peat moss (Natural Organic Matter, NOM),. The results indicated extremely low breakthrough at iodine vapor concentrations close to saturation (Task 15).
- We have tested and used the ion selective electrode to monitor iodine vapor breakthrough (after bisulfite reduction) in the iodine generator experiments. Also, the ion chromatography method for separation of various iodine species was tested (Task 15).
- We have examined the kinetics of iodine oxidation by chlorine sulfonamide resins. These resins may be used with NOM to promote iodine binding (Task 15).
- We have begun assembling an apparatus for simulating nuclear fuel dissolution. Several additional glass items were ordered and we are awaiting delivery (Task 15).

## UNLV TRP Transmutation Sciences

- Niobium cavities design optimization code appears to be working but is converging to undesired geometries having same constraints (Task 2).

- Flow visualization system modified with new back-lighting system and camera deployment. Flow visualization system has completed testing phase and is ready for experimental use (Task 2).
- Maintenance of the X-ray Photoelectron Spectroscopy (XPS) system was completed (Task 3).
- Analysis of HT-9 steel samples initiated (Task 3).
- Experimental design for benchtop LBE corrosion experiments at UNLV completed (Task 3).
- Stress corrosion cracking (SCC) tests using constant-load and slow-strain-rate (SSR) techniques are ongoing in aqueous solutions at ambient and elevated temperatures (Task 4).
- SCC tests under controlled cathodic potentials (with respect to the corrosion potential) are ongoing to evaluate the effect of hydrogen charging on cracking (Task 4).
- Localized corrosion (pitting and crevice) behavior of all three alloys is being evaluated by cyclic potentiodynamic polarization (CPP) method (Task 4).
- Metallographic and Fractographic evaluations on failed samples are in progress (Task 4).
- Modeling and simulation of the DELTA Loop geometry is being benchmarked against observations at LANL (Task 5).
- Modeling of sudden expansion geometry work simulation is proceeding and is now able to predict some already existing 3-D experimental work (Task 5).
- Nuclear Transport Code Models (MCNP 4B, MCNPX) needed to finalize the  $^6\text{Li}$  glass fiber neutron multiplicity detector prototype design were completed. Detector design was finalized subsequent to completion and analysis of modeling results (Task 6)

- Production of detector material ( $^6\text{Li}$  glass fiber) for the prototype sensor was begun and is nearing completion. Neutron Multiplicity detector prototype ( $^6\text{Li}$  glass fiber detector) is ~70% complete for all hardware and electronic card production (for optoelectronic interfaces, light guides, signal train, firmware). Communication output hardware and software is about 80% completed. Prompt signal circuitry needed for the detector to communicate with the cyclotron signals is ~60% completed (Task 6).
- $^3\text{He}$  Neutron Multiplicity detector prototype (64 element) is nearing 90% completion and will be shipped to UNLV from Russia in April (Task 6).
- Testing of the  $^6\text{Li}$  glass fiber detector system prototype scheduled at the Crocker Nuclear Laboratory, University of California, Davis for late April – Early May 2003 (Task 6).
- International DCC consortium met at UNLV to:
  - Provide updates from consortium members on progress
  - Develop a new timeline for completion of dose coefficient calculations
  - Compare and contrasted results of DCs from different institutions
  - Finalize the methodology for the calculation of the DCs (Task 7)
- Modifications to the computer codes used to calculate dose were completed with the assistance of Dr. K. Eckerman, ORNL (Task 7).
- The high-temperature, inert atmosphere testing cell for the Materials Testing System (MTS) has been completed and is now available for experiments (Task 10).
- Ambient temperature tensile testing of alloy EP-823 has been initiated (Task 10).
- A 2-dimensional model of the oxygen-sensor/LBE experimental set-up was completed using

FEMLAB. Initial simulations of oxygen transport have begun (Task 13).

- Cold-worked, bent and welded specimens of heat-treated Alloy EP-823 and Type 304L stainless steel are being evaluated for residual stress measurements using positron annihilation spectroscopy at the Idaho State University and X-ray and Ring-Core methods at the Lambda Research Laboratory (Task 14).

***For more information on Transmutation contact:  
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# University Research Alliance - Fellowship Program

## University Programs

- Four FY02 fellows attended the AFCI Quarterly Meeting: Jennifer Ladd (UT-Knoxville), Tom Carter (University of Florida), Frank Szakaly (Texas A&M), and Michael Gregson (University of Texas).
- Seven fellows provided posters for the AFCI Quarterly Meeting: Jennifer Ladd, Tom Carter, Frank Szakaly, Michael Gregson, and FY01 fellows Jim Platte (University of Michigan), Alan Bolind (University of Illinois at Urbana-Champaign, and Leigh Outten (MIT).
- Program management is developing the AFCI Fellowship Program Announcement for master's degree and Ph.D. degree students. The Program Announcement will be distributed when funding is available.
- Program Management is verifying and adding to the Fellowship Program Announcement mailing list.
- Program Management is preparing the AFCI University Fellowship Program web site for the upcoming fellowship cycle.
- AFCI '02 Fellow Shafaq Amdani has withdrawn from school citing personal problems. She has been granted a leave of absence through September 1, 2003.
- AFCI '02 fellow Mike Gregson, UT, has been working on modeling an accelerator driven core within MCNP based upon research and AFCI designs. "The MCNP deck is being converted into an MCNPx deck such that simulation of GeV protons can take place." With the completion of the "decks and a successful run" he will be able to evaluate and write about what has been learned from the design. Mike says that the LANL Accelerators group is interested in the data from the project and a subsequent graduate student will continue the work.
- Mike Gregson will graduate in May. He has accepted a position at Sandia National Laboratories.
- FY'01 fellow Frank Szakaly is working on writing the code for the MOCUP modeling program. He is working on getting reference reactor design information from the national labs so that he can model the fuel pins for at least one of the Gen IV designs.
- FY '01 fellow Jim Platte has constructed a model of the July 2002 LANSCE irradiation on a 50 cm long, 40 cm diameter lead-bismuth eutectic target using the high energy physics code MCNPX. The neutron spectrum calculated by the MCNPX model was used as an initial guess neutron spectrum in the input of the spectral unfolding code STAYSL, which recalculated the neutron spectrum based on foil activation data. The two spectra, STAYSL and MCNPX, were then compared to gauge the accuracy of the MCNPX calculation.
- Lee Van Duyn, '02 fellow, Georgia Tech, is keeping in close contact with ANL-W researchers so that he can spend next summer at the laboratory furthering his research. He is gathering material properties, and trying to characterize what he needs to construct a successful model. He is also learning how to use the computer code ANSYS so that it can do the modeling he needs in order to fully understand the aspects of his research topic. Lee intends to make a presentation at the ANS student conference in April or at the ANS Accelerator Applications conference in June.
- FY'02 fellow Lisa Cordova is planning to complete her degree in December. Meanwhile, she is working part time at Sandia National Laboratories and is developing her computer/simulations skills.
- Thomas Roddey, FY'01 fellow, UC-Berkeley, is

## ***University Research Alliance - Fellowship Program***

working as a Nuclear Licensing Engineer for Exelon Nuclear Corporation, Mid-West Regional Operating Group. His job entails acting as a corresponding liaison between Exelon and the NRC. Thomas expects to finish writing his project report by the end of March and give his final presentation during the week of May 5, 2003. These steps will complete Thomas' master's degree requirements.

### **Issue**

- The program budget has been cut to zero for the FY03 program.

***For more information on Transmutation contact:  
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